

I CLAIM:

1. A dispensing apparatus for dispensing fluids to a patient comprising:
 - (a) an outer housing;
 - (b) a plurality of inner, expandable housings disposed within said outer housing, each of said inner expandable housings having a fluid reservoir provided with an inlet for permitting fluid flow into said fluid reservoir and an outlet for permitting fluid flow from said fluid reservoir;
 - (c) a plurality of stored energy means disposed within said outer housing and operably associated with said plurality of inner expandable housings for acting upon said housings to cause the fluid contained within the fluid reservoirs thereof to controllably flow through said outlets, each of said stored energy means comprising yieldably deformable member carried within said outer housing, each of said compressively deformable members being expandable to cause fluid flow from said fluid reservoirs;
 - (d) at least one fill means carried by said outer housing and being in communication with said inlets of said fluid reservoirs for filling said reservoirs with the fluid to be dispensed;
 - (e) fluid delivery means connected to said outer housing and being in communication with said outlets of said fluid reservoirs for delivering fluids to the patient; and

(f) flow control means carried by said outer housing for controlling fluid flow from said reservoirs toward said fluid delivery means, said flow control means being in communication with said outlets of said load reservoirs and being in communication with said fluid delivery means, said flow control means comprising:

(i) flow rate control means carried within said outer housing and being in communication with said outlets of said fluid reservoirs for controlling the rate of fluid flow toward said fluid delivery means; and

(ii) flow regulating means carried within the said outer housing and being in communication with said flow rate control means for regulating the flow of fluids flowing from said flow rate control means toward said fluid delivery means.

2. The apparatus as defined in claim 1 in which said yieldably deformable members each comprise a flexible polymeric member.

3. The apparatus as defined in claim 1 in which each said yieldably deformable member comprises a spring.

4. The apparatus as defined in claim 1 in which said inner expandable housings each comprise a bellows structure having an accordion like side wall movable from a substantially collapsed configuration to a substantially expanded

configuration by fluid flowing into said fluid reservoir defined by said bellows structure.

5. The apparatus as defined in claim 1 in which said flow rate control means comprises a plurality of flow control members, each said flow control member having a plurality of elongated flow control channels formed therein and each being rotatable within a selected one of said inner expandable housings.

6. The apparatus as defined in claim 1 in which said flow regulating means comprises a mixing and dispensing knob rotatably carried by said outer housing, said mixing and dispensing knob having inlets in communication with said flow rate control means.

7. The apparatus as defined in claim 1 in which said fill means comprises a plurality of fill vials receivable within said outer housing.

8. The apparatus as defined in claim 7 in which said outer housing includes:

(a) a plurality of spaced apart receiving chambers for telescopically receiving said plurality of fill vials; and

(b) an elongated support mounted within each of said receiving chambers, each said elongated support having an elongated hollow needle, said hollow needle defining a flow passageway in communication with a selected one of said fluid reservoirs.

9. The apparatus as defined in claim 8 in which each of said fill vials has a first open end, a closed second end and in which each includes ;

(a) a fluid reservoir disposed between said first and second ends;
and

(b) a pierceable plunger disposed within said fluid reservoir for movement between first and second positions.

10. A dispensing apparatus for dispensing fluids to a patient comprising:

(a) an outer housing having an upper portion and a lower portion, said lower portion having a plurality of spaced apart vial receiving chambers;

(b) a plurality of inner, expandable housings disposed within said lower portion of said outer housing, each of said inner expandable housings comprising a bellows structure having an accordion like side wall defining a fluid reservoir, each said accordion like side wall being movable from a substantially collapsed configuration to a substantially expanded configuration by fluid flowing into said fluid reservoir, each said vial reservoir having an inlet for permitting fluid flow into said fluid reservoir and an outlet for permitting fluid flow from said fluid reservoir;

(c) a plurality of stored energy means disposed within said lower portion of said outer housing for acting upon said plurality of inner

expandable housings to cause the fluid contained within said fluid reservoirs thereof to controllably flow through said outlets, each of said stored energy means comprising a compressively deformable, cellular member carried within said outer housing, each of said cellular members being expandable to cause fluid flow from said fluid reservoirs;

(d) a plurality of fill means carried by said lower portion of said outer housing and in communication with said inlets of said fluid reservoirs for filling said reservoirs with the fluid to be dispensed, each said fill means comprising a fill vial receivable within a selected one said vial receiving chambers of said lower portion of said outer housing;

(e) fluid delivery means in communication with said outlets of said fluid reservoirs for delivering fluids to the patient; and

(f) flow control means carried by said outer housing for controlling fluid flow from said reservoirs toward said fluid delivery means, said flow control means being in communication with said outlets of said fluid reservoirs and being in communication with said fluid delivery means, said flow control means comprising:

(i) flow rate control means carried within said lower portion of said outer housing and being in communication with said outlets of said fluid reservoirs for controlling the rate of fluid flow toward said

fluid delivery means, said flow rate control means comprising a plurality of flow control members, each said flow control member having a plurality of elongated flow control channels formed therein and each being rotatable within a selected one of said inner expandable housings; and

(ii) flow regulating means carried within the said upper portion of said outer housing and in communication with said flow rate control means for regulating the fluids flowing from said flow rate control means toward said fluid delivery means, said flow regulating means comprising a mixing and dispensing knob rotatably carried by said upper portion of said outer housing, said mixing and dispensing knob having a plurality of inlets in communication with said flow rate control means.

11. The apparatus as defined in claim 10 further including an elongated support disposed within each of said lower receiving chambers, each said elongated support having an elongated hollow needle defining a flow passageway in communication with a selected one of said fluid reservoirs.

12. The apparatus as defined in claim 10 in which each of said fill vials has a first open end, a closed second end and in which each includes:

(a) a fluid reservoir disposed between said first and second ends;
and

(b) a pierceable plunger disposed within said fluid reservoir for movement between first and second positions.

13. The apparatus as defined in claim 10 in which said mixing and dispensing knob has a central fluid flow passageway and a plurality of radially extending fluid flow passageways in communication with said central flow passageway, said radially extending flow passageways being in communication with said flow rate control means.

14. The apparatus as defined in claim 10 in which said flow rate control means further includes a plurality of thumbwheels rotatably carried by said lower portion of said outer housing, said thumbwheels being interconnected with said flow control members for imparting rotation thereto.

15. The apparatus as defined in claim 10 in which said flow rate control means further includes a plurality of indicator drums carried by said lower portion of said outer housing, each of said indicator drums having flow rate indicia imprinted thereon each and being interconnected with a selected one of said thumbwheels for rotation thereby.

16. The apparatus as defined in claim 10 further including knob-locking means carried by said upper portion of said outer housing for locking said mixing

and dispensing knob against rotation.

17. The apparatus as defined in claim 10 further including safety disabling means carried by said upper portion of said outer housing for blocking fluid flow toward said delivery means.

18. The apparatus as defined in claim 10 in which said elongated flow control channels formed in said fluid control members are coated with a coating that is compatible with the fluids contained within the fluid reservoirs.

19. A dispensing apparatus for dispensing fluids to a patient comprising:

(a) an outer housing having an upper portion and a lower portion, said lower portion having a plurality of spaced apart vial receiving chambers each said vial receiving chamber having an elongated support having an elongated hollow needle defining a flow passageway;

(b) a plurality of inner, expandable housings disposed within said lower portion of said outer housing, each of said inner expandable housings comprising a bellows structure having an accordion like side wall defining a fluid reservoir, each said accordion like side wall being movable from a substantially collapsed configuration to a substantially expanded configuration by fluid flowing into said fluid reservoir each said load reservoir having an inlet for permitting fluid flow into said fluid reservoir and an outlet for permitting fluid flow from said fluid reservoir;

(c) a plurality of stored energy means disposed within said lower portion of said outer housing for acting upon said plurality of inner expandable housing to cause the fluid contained within said fluid reservoirs thereof to controllably flow through said outlets, each of said stored energy means comprising a yieldably deformable spring that is expandable to cause fluid flow from said fluid reservoirs;

(d) a plurality of fill means carried by said lower portion of said outer housing and in communication with said inlets of said fluid reservoirs for filling said reservoirs with the fluid to be dispensed, each said fill means comprising a fill vial receivable within a selected one said vial receiving chambers of said lower portion of said outer housing;

(e) fluid delivery means in communication with said outlets of said fluid reservoirs for delivering fluids to the patient; and

(f) flow control means carried by said outer housing for controlling fluid flow from said reservoirs toward said fluid delivery means, said flow control means being in communication with said outlets of said fluid reservoirs and being in communication with said fluid delivery means, said flow control means comprising flow rate control means carried within said lower portion of said outer housing and being in communication with said

outlets of said fluid reservoirs for controlling the rate of fluid flow toward said fluid delivery means.

20. The apparatus as defined in claim 19 in which said flow rate control means comprises:

(a) a plurality of flow control members, each said flow control member having a plurality of elongated flow control channels formed therein and each being rotatable within a selected one of said inner expandable housings;

(b) a plurality of thumbwheels rotatably carried by said lower portion of said outer housing, said thumbwheels being interconnected with said flow control members for imparting rotation thereto; and

(c) a plurality of indicator drums carried by said lower portion of said outer housing, said indicator drums having flow rate indicia imprinted thereon and being interconnected with said thumbwheels for rotation thereby.

21. The apparatus as defined in claim 19 in which said flow rate control means comprises at least one flow control plate, having a fluid flow channel formed therein.

22. The apparatus as defined in claim 19 in which said flow rate control

means comprises a plurality of flow control plates each having a fluid flow microchannel formed therein.

23. The apparatus as defined in claim 19 in which said flow rate control means comprises a plurality of flow control plates each having a fluid flow capillary.

24. The apparatus as defined in claim 19 in which said fluid flow channel is coated.

25. The apparatus as defined in claim 19 further including flow regulating means carried within the said upper portion of said outer housing and in communication with said flow rate control means for regulating the fluids flowing from said flow rate control means toward said fluid delivery means, said flow regulating means comprising a mixing and dispensing knob rotatably carried within said upper portion of said outer housing, said mixing and dispensing knob having a plurality inlets in communication with said flow rate control means.

26. The apparatus as defined in claim 25 in which said mixing and dispensing knob has a central fluid flow passageway and a plurality of radially extending fluid flow passageways being in communication with said central flow passageway, said radially extending flow passageways being in communication with said flow rate control means.

27. The apparatus as defined in claim 25 in which each of said fill vials

has a first open end, a closed second end and in which each includes:

(a) a fluid reservoir disposed between said first and second ends;

and

(b) a pierceable plunger disposed within said fluid reservoir for movement between first and second positions.

28. The apparatus as defined in claim 27 in which at least one of said fill vials comprises a field fill vial.

29. The apparatus as defined in claim 27 further including safety disabling means carried by said upper portion of said outer housing for blocking fluid flow toward said delivery means.

30. The apparatus as defined in claim 27 in which said elongated flow control channels formed in said fluid control members are coated with a coating that is compatible with said fluids contained within the fluid reservoirs.

31. The apparatus as defined in claim 27 further including knob-locking means carried by said upper portion of said outer housing for locking said mixing and dispensing knob against rotation.

32. The apparatus as defined in claim 27 in which said spring member comprises a metal spring.

33. The apparatus as defined in claim 27 in which said spring member comprises a constant force extension spring.

34. The apparatus as defined in claim 27 in which said spring member comprises a wave spring.

35. The apparatus as defined in claim 27 in which said spring member comprises a plastic spring.

36. The apparatus as defined in claim 27, further including volume indicator means carried by said outer housing for indicating the volume of fluid remaining in said fluid reservoir.

37. The apparatus as defined in claim 36 in which said according-like side walls of said expandable housings are coated with a coating that is compatible with the fluids contained within said fluid reservoirs.